
Here.
There.
Everywhere.
NASA
A leaf falls from a tree, dancing in a breeze as it floats to the ground.
In the playground across the street, laughing children tighten their grips to hold themselves on the merry-go-round.
Back in the kitchen, a metal lid rattles under the pressure of steam escaping from the tea kettle below.
Our daily experiences reveal much about how our world works. Thinking about everyday examples from the world around us helps form our basic understanding of physics.
As far as we know, these laws of physics are universal.
They apply here.
They apply there.
They apply everywhere.
In this collection we show how our knowledge of familiar processes can be applied to help us understand similar behavior on grander scales, and in very different environments.
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Physics All Around.

The physical processes of our natural world are on constant display. They shape our surroundings on scales large and small. Across the Universe, Nature does the same. We can better understand cosmic phenomena by looking and studying what we see close to home. BECAUSE WHAT HAPPENS HERE, HAPPENS THERE, AND EVERYWHERE.

LIGHT THAT DOES NOT PASS You are relaxing with a book on a nice sunny day when a friend leans over your shoulder and the page goes dark. "Hey, you're blocking my light!" It is a familiar experience. Any time an object blocks the light from another source, it forms a shadow.

WHERE THE WIND BLOWS Winds can move particles from one place to another. On Earth, winds can blow briefly during a storm, and over long time scales, as in the jet stream. Winds have also been detected on other planets, in the space between stars, and in galaxies.

ATOMIC LIGHT SHOW Atoms, the building blocks of matter, are constantly in motion, moving around at speeds that are thousands of miles per hour at room temperatures, and millions of miles per hour behind a supernova shock wave. In a collision of an atom with another atom, or with a free-roaming electron, energy can be transferred to the atom. This extra energy can then be released in the form of a light wave.

BENT LIGHT When the path of a light ray is bent, the image of the light source becomes distorted. For example, a magnified image is produced by the bending of light as it passes from the air into the lenses of eyeglasses. Likewise, the setting Sun appears flattened because sunlight is bent as it travels through the atmosphere. Light paths can also be bent through the warping of space by a massive galaxy or galaxy cluster, which distorts the images of more distant background galaxies.

ZAP! You shuffle along a carpet, reach out to touch a doorknob and—zap!—a sudden flow of current, or electric discharge, gives you a mild shock. The cause? Friction between your feet and the carpet built up negative electric charge on your body. Electric discharges can occur wherever there is a large build-up of electric charge, and can create spectacular displays of sudden energy release on Earth and in space.

THE SHAPE OF SPEED As a duck paddles across a pond, it creates ripples or waves that move out in front of it. If the duck paddles fast enough, the ripples will merge into a cone-shaped wall of water called a bow wave. Bow waves are familiar sights in front of boats as well, and can also be formed in the atmosphere and in space when objects move more rapidly than the speed of waves in their liquid or gas environments.

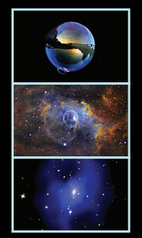
Pillars of Erosion. The relentless action of winds slowly carve away at the environment, leaving behind sculptures from erosion. Microchip fabrication uses particle beams to erode material and create structures on the surface. Prolonged wind erosion in deserts leaves behind columns of dense rock. Winds from bright stars blow away their surroundings to unveil dense regions of gas from which stars are forming.

Seeding the Environment. The actions that facilitate new growth and evolution come in many stages. Bees distribute pollen, promoting reproduction in plants. Farmers seed and fertilize soil, enabling growth of selected plants. Supernova explosions distribute iron, oxygen, and other heavy elements necessary for the ultimate formation of planets and their contents.

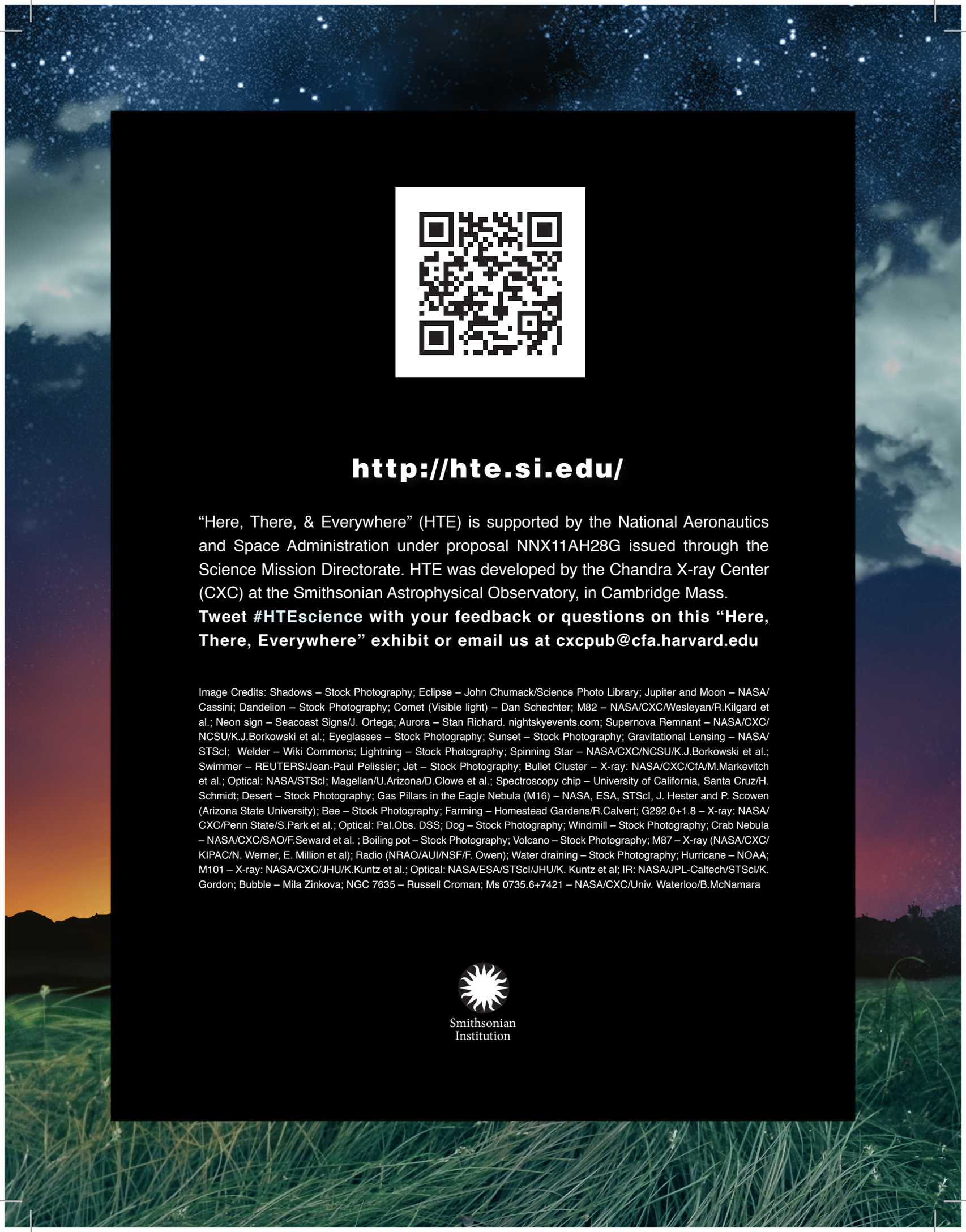
From Rotation to Outflows. Creatively twisting her body back and forth, a dog shakes off the water from a recent soaking. This use of rotational energy to produce outflows can be seen on farms, where windmills pump water to surrounding fields, and deep in space where rapidly-rotating, highly magnetic neutron stars generate outflows of energetic particles.

Explosive Eruptions. As heat is injected from below, pressure builds. Pockets of high pressure eventually erupt, in the form of splattering chili on a camp stove, massive eruptions from volcanoes, and energetic eruptions powered by jets that form from material falling into massive black holes.

Spirals in Nature. The common spiral shape immediately brings to view the action of rotation. Water winds its way down the drain in a sink. Moist air spirals its way into the low-pressure center of a hurricane. Even the rotation of a galaxy imprints its structure in the form of dense spiral arms that trace regions of star formation.



Bubbles Large and Small. A gentle breath of air into a soap film creates a majestic bubble. In space, more ferocious winds from an energetic star create a large bubble in the surrounding interstellar matter. Larger still are the huge bubbles created as jets from matter falling onto a huge black hole expand into the material in a galaxy cluster.



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